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Sources of instability in Australian wheat production

Xueling Li

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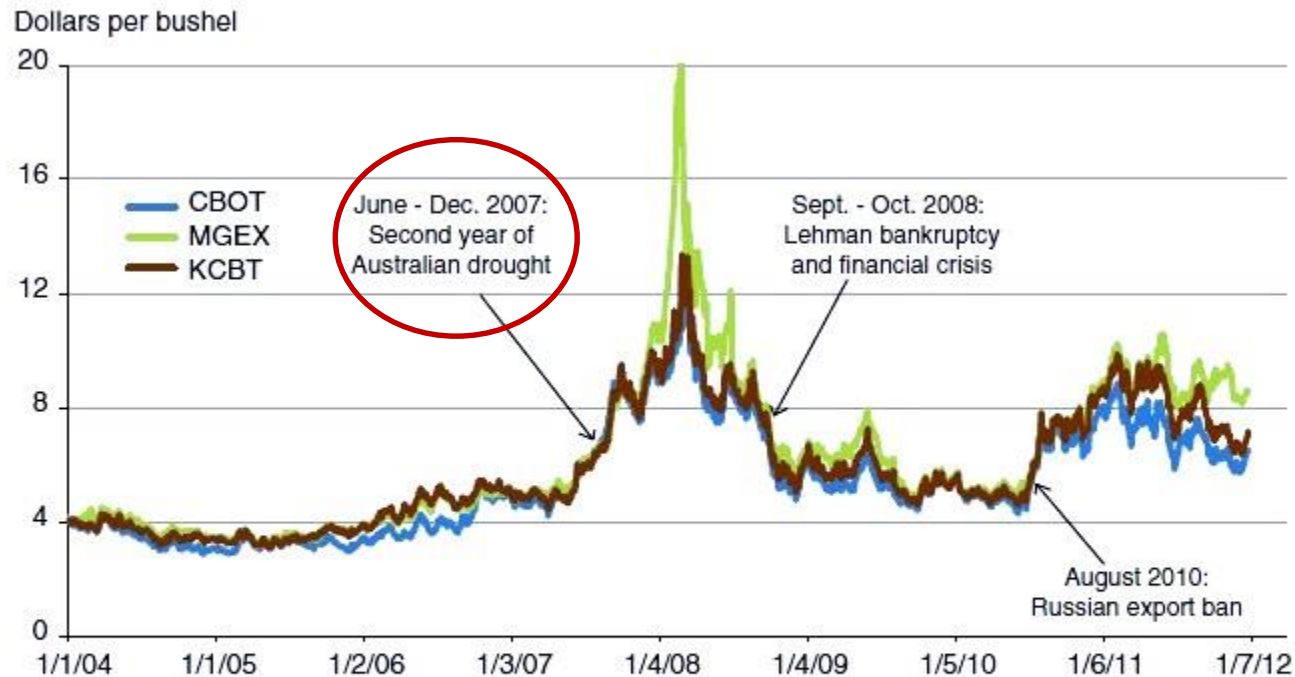
Sources of instability in Australian wheat production

Xueling Li
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Introduction

- Australia is one of the largest wheat exporters
- Wheat production has significant year to year variation (eg: 26 Mt 2003 VS 10Mt 2004)
- This instability of production could influence global food markets. (Next Slide)
- Production (P) = Area (A) * Yield (Y)
- Variance decomposition of historical wheat production can analyse the sources of the instability

Introduction



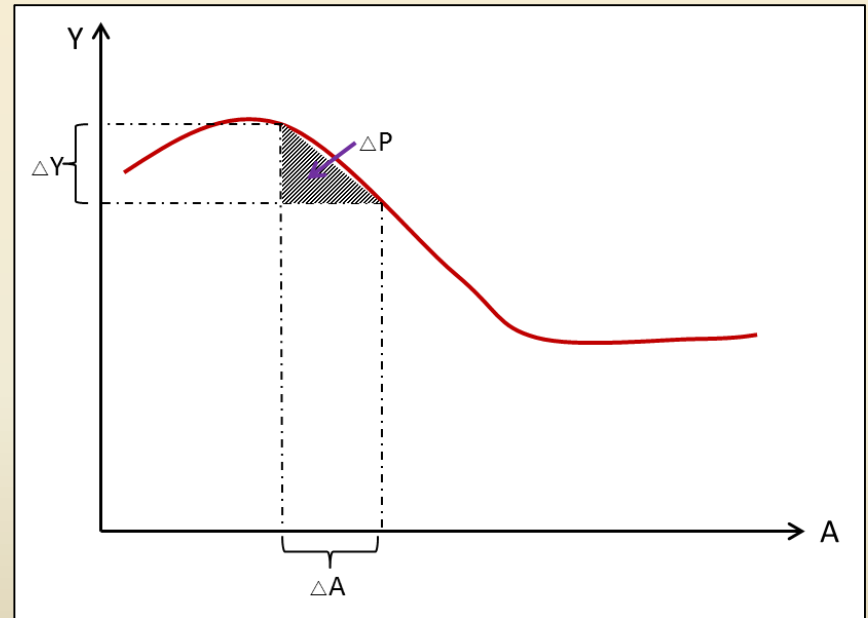
Note: MGEX = Minneapolis Grain Exchange. KCBT = Kansas City Board of Trade. CBOT = Chicago Board of Trade.
Source: USDA, Economic Research Service using data from Commodity Research Bureau (2011), "Futures Price Database."

Decomposition Analysis

Data sources

- **National** and **State** Data from ABS
- **Shire** Data from “Winter cereal production statistics, NSW 1922-2000 : wheat, oats, barley : area production and yield”

$$\Delta P = f(\Delta A, \Delta Y)$$



Decomposition Analysis

Method 1:

$$\Delta TP = \sum |\Delta Y(i) \times A(i-1)| + \sum |Y(i-1) \times \Delta A(i)| + \sum |\Delta Y(i) \times \Delta A(i)|$$

$$IY = (\sum |\Delta Y(i) \times A(i-1)| / \Delta TP) \times 100\%$$

$$IA = (\sum |Y(i-1) \times \Delta A(i)| / \Delta TP) \times 100\%$$

$$IYA = (\sum |\Delta Y(i) \times \Delta A(i)| / \Delta TP) \times 100\%$$

ΔTP : sum of yearly fluctuation of wheat production;

IY : the effect of yield per unit

IA : the effect of sowing area

IYA : the interaction effect of yield and area

Decomposition Analysis

Method 2:

$$\begin{aligned}\Delta E(P) &= E(P_i) - E(P_{i-1}) \\ &= \bar{A}_{i-1}\Delta\bar{y} + \bar{y}_{i-1}\Delta\bar{A} + \Delta\bar{A}\Delta\bar{y} + \Delta cov(\bar{A}, \bar{y})\end{aligned}$$

\bar{A} and \bar{y} denote mean areas and yields

$\Delta E(P)$: Change in the Average Production

$\bar{A}_{i-1}\Delta\bar{y}$: Change in Mean Yields

$\bar{y}_{i-1}\Delta\bar{A}$: Change in Mean Areas

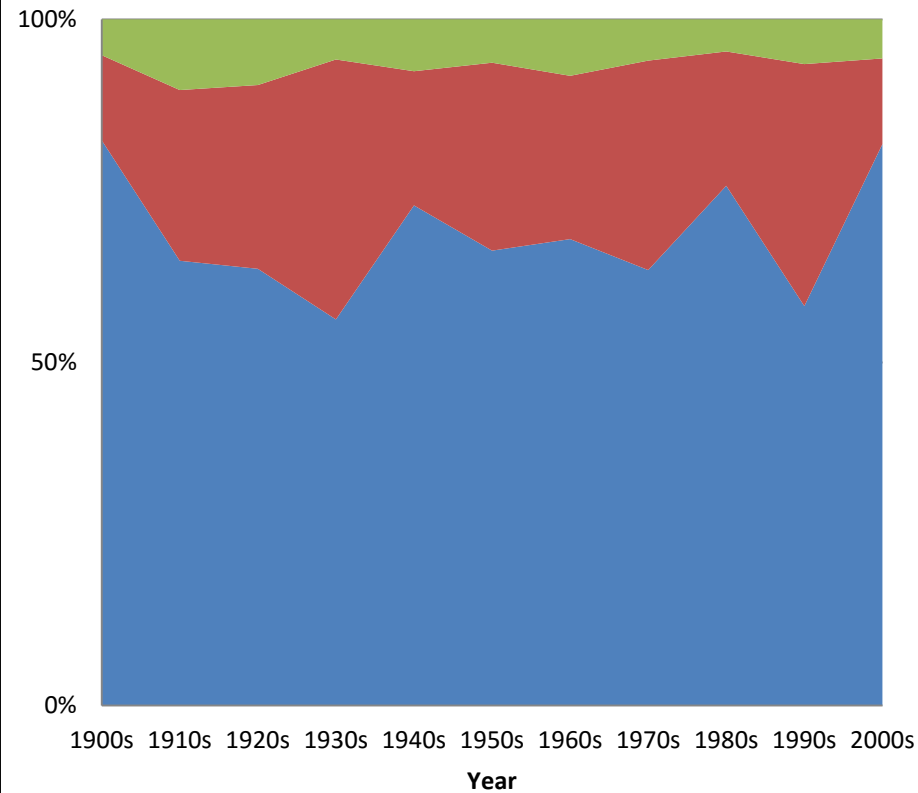
$\Delta\bar{A}\Delta\bar{y}$: Interaction between Changes in Mean yields and Mean Areas

$\Delta cov(\bar{A}, \bar{y})$: Change in Area-Yield Covariances

Results

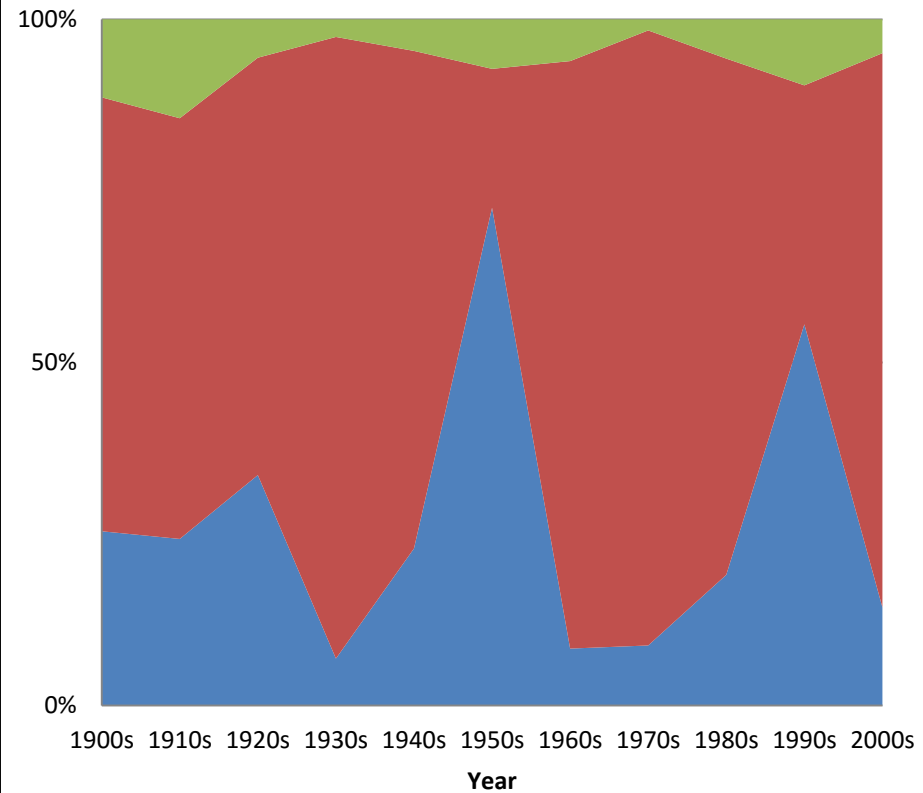
Average **yearly** fluctuation

■ IY ■ IA ■ IYA

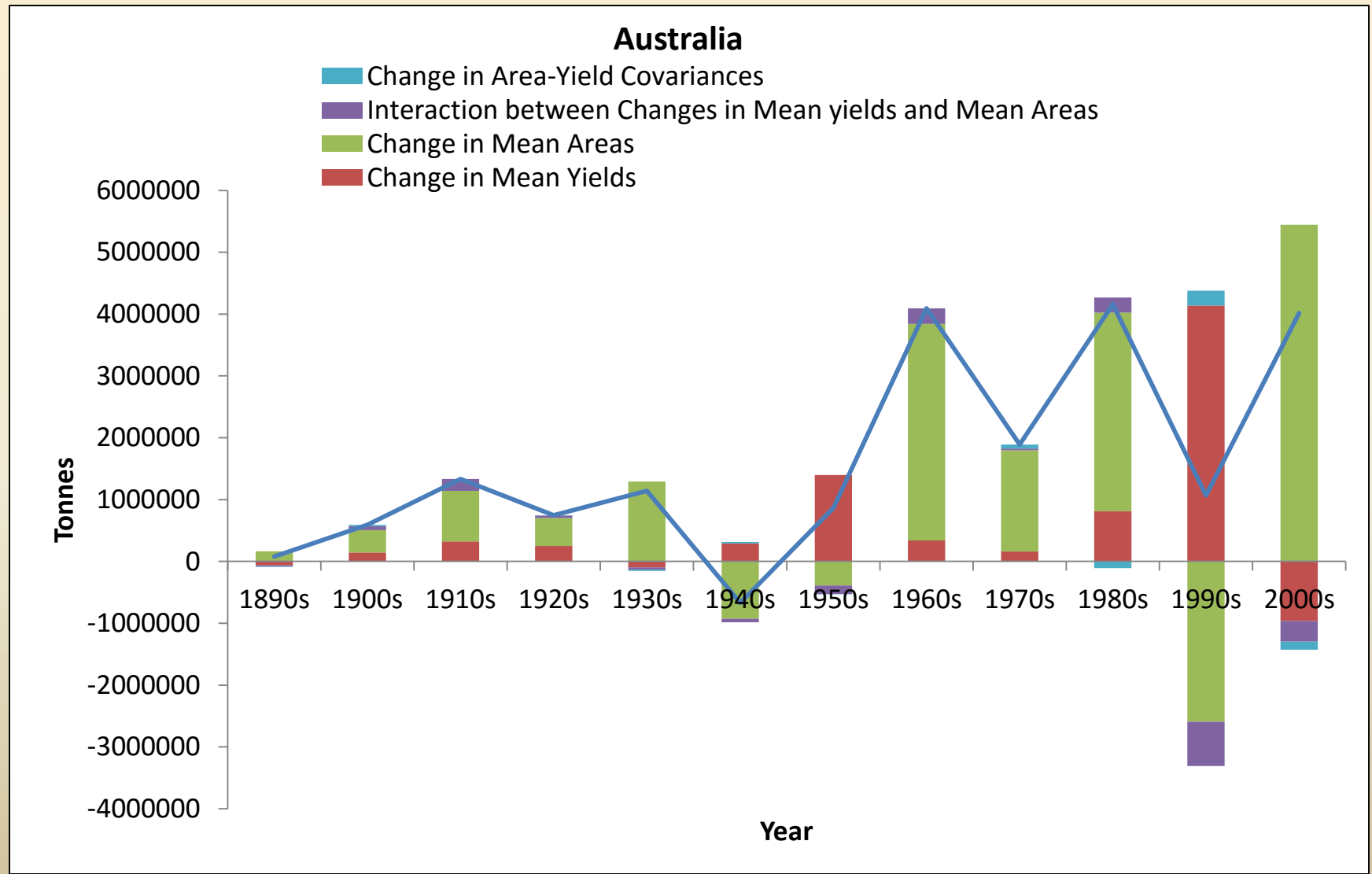


Decadal fluctuation

■ IY ■ IA ■ IYA

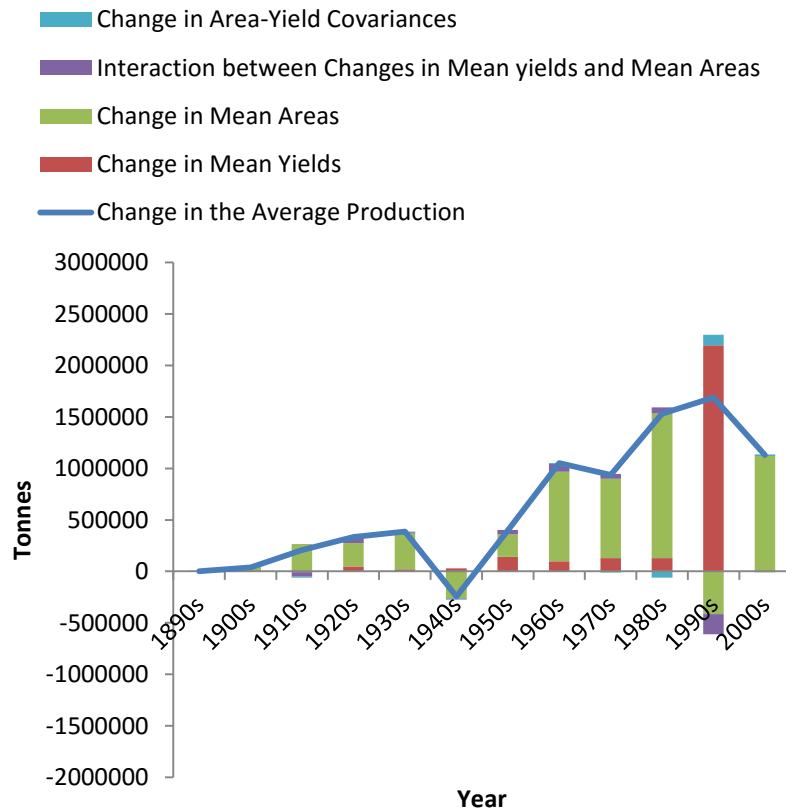


Components of change in average production (decadal)

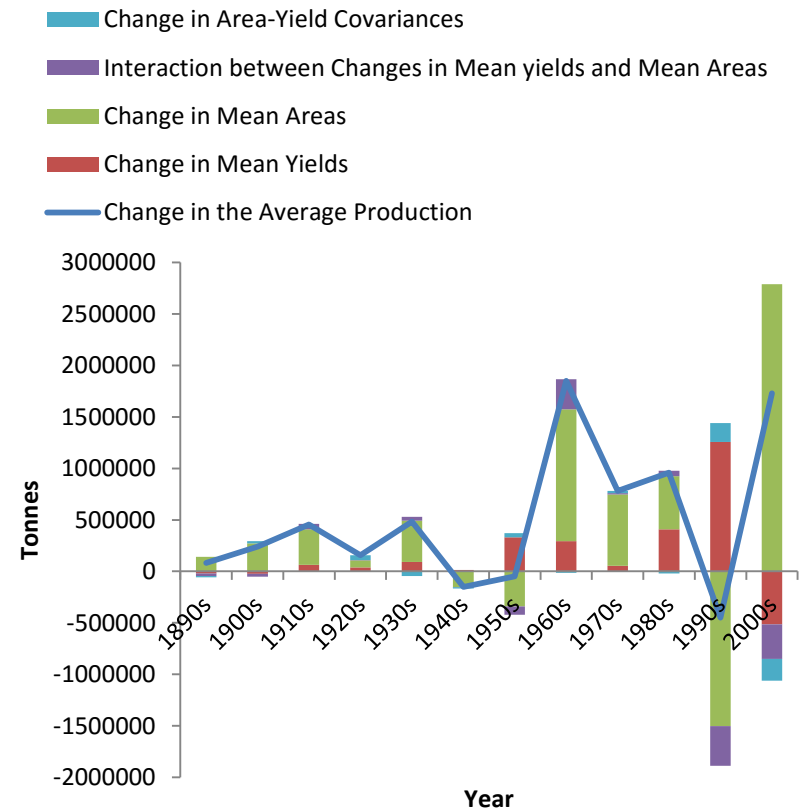


Components of change in average production (decadal)

WA

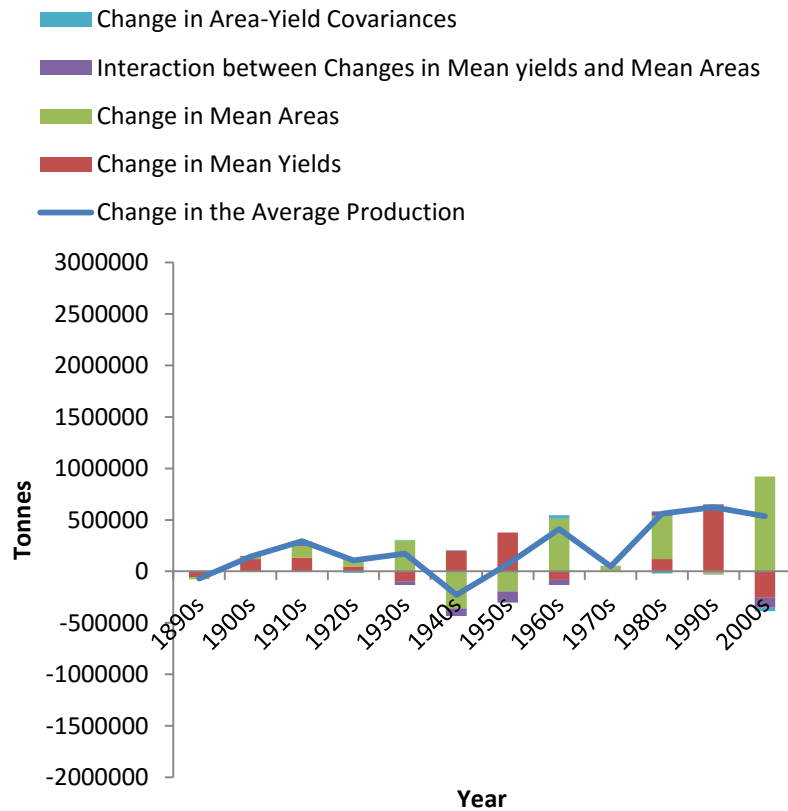


NSW

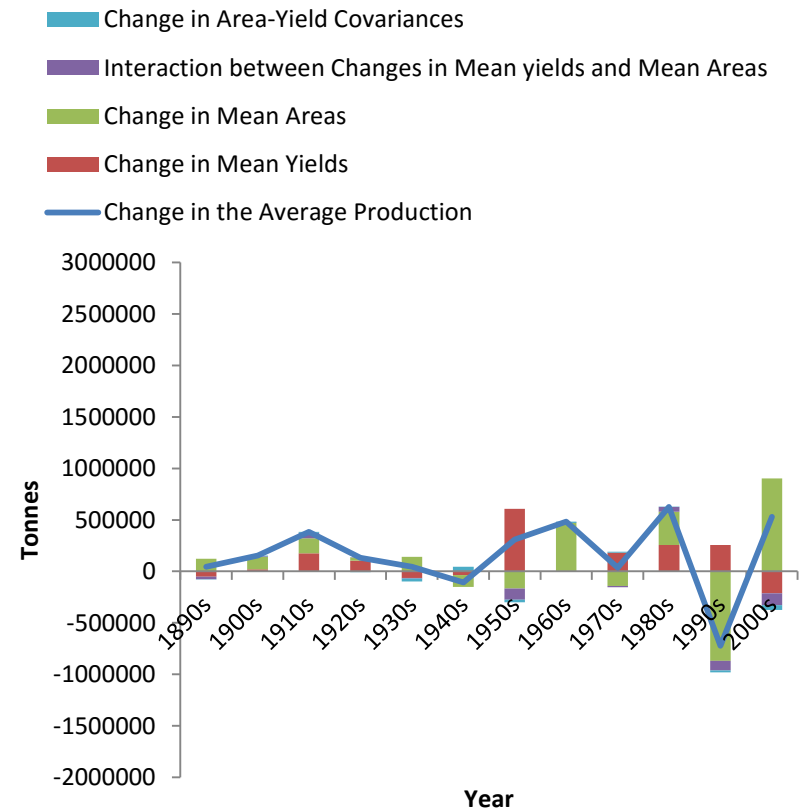


Components of change in average production (decadal)

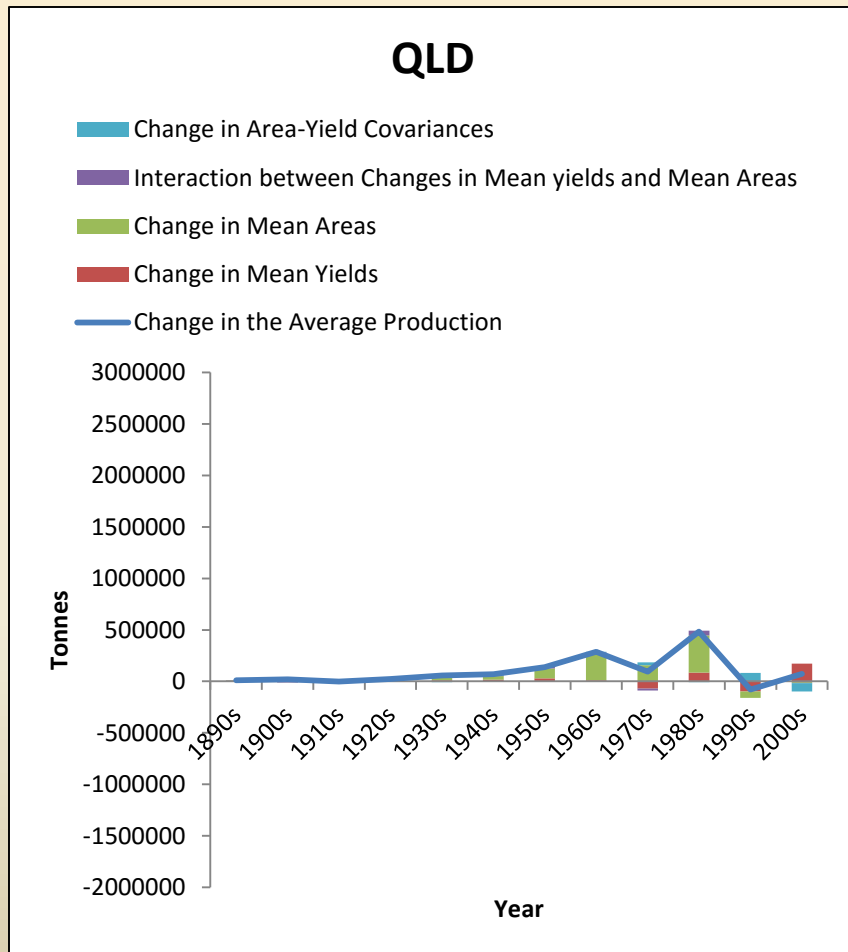
SA



VIC

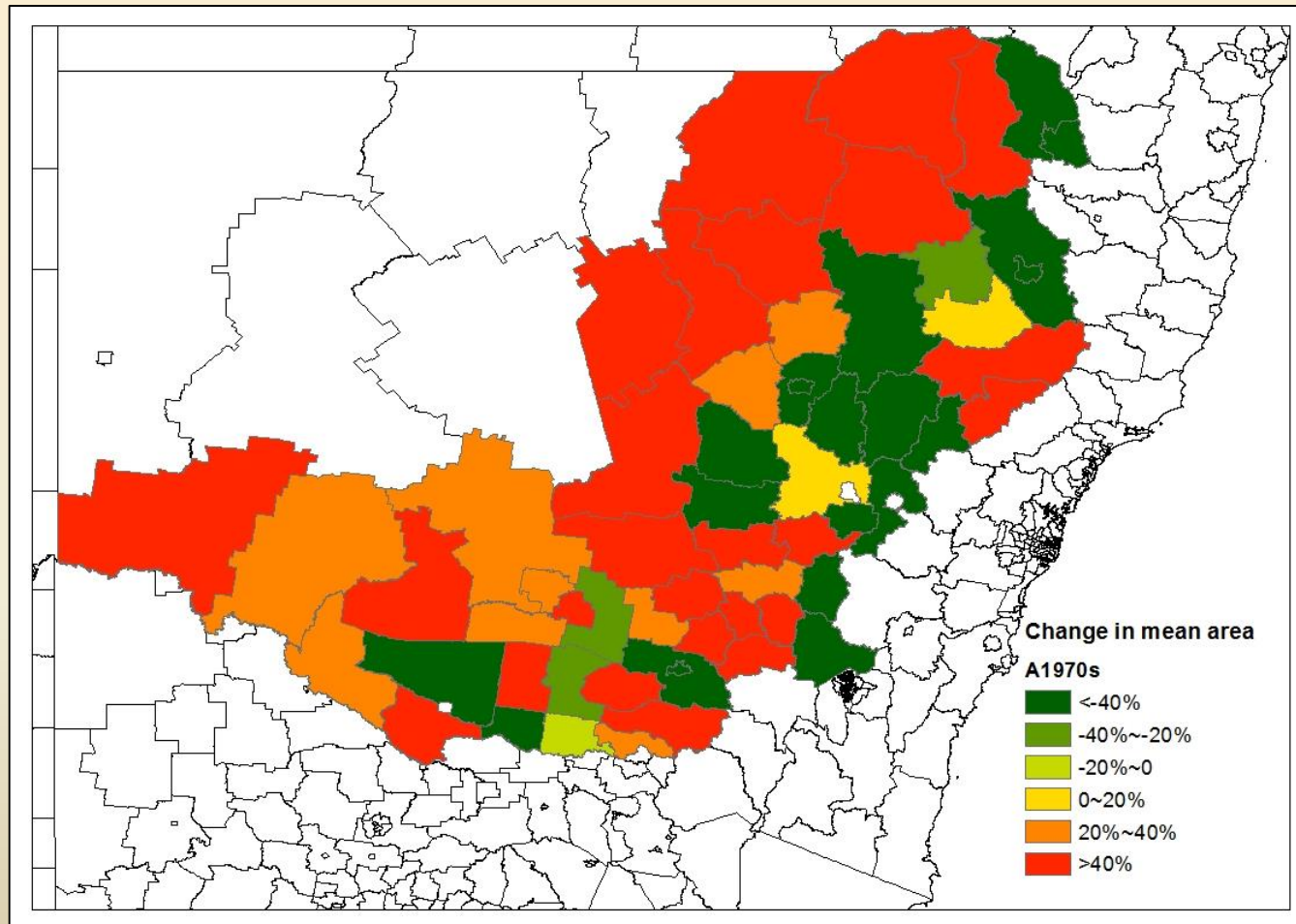


Components of change in average production (**decadal**)

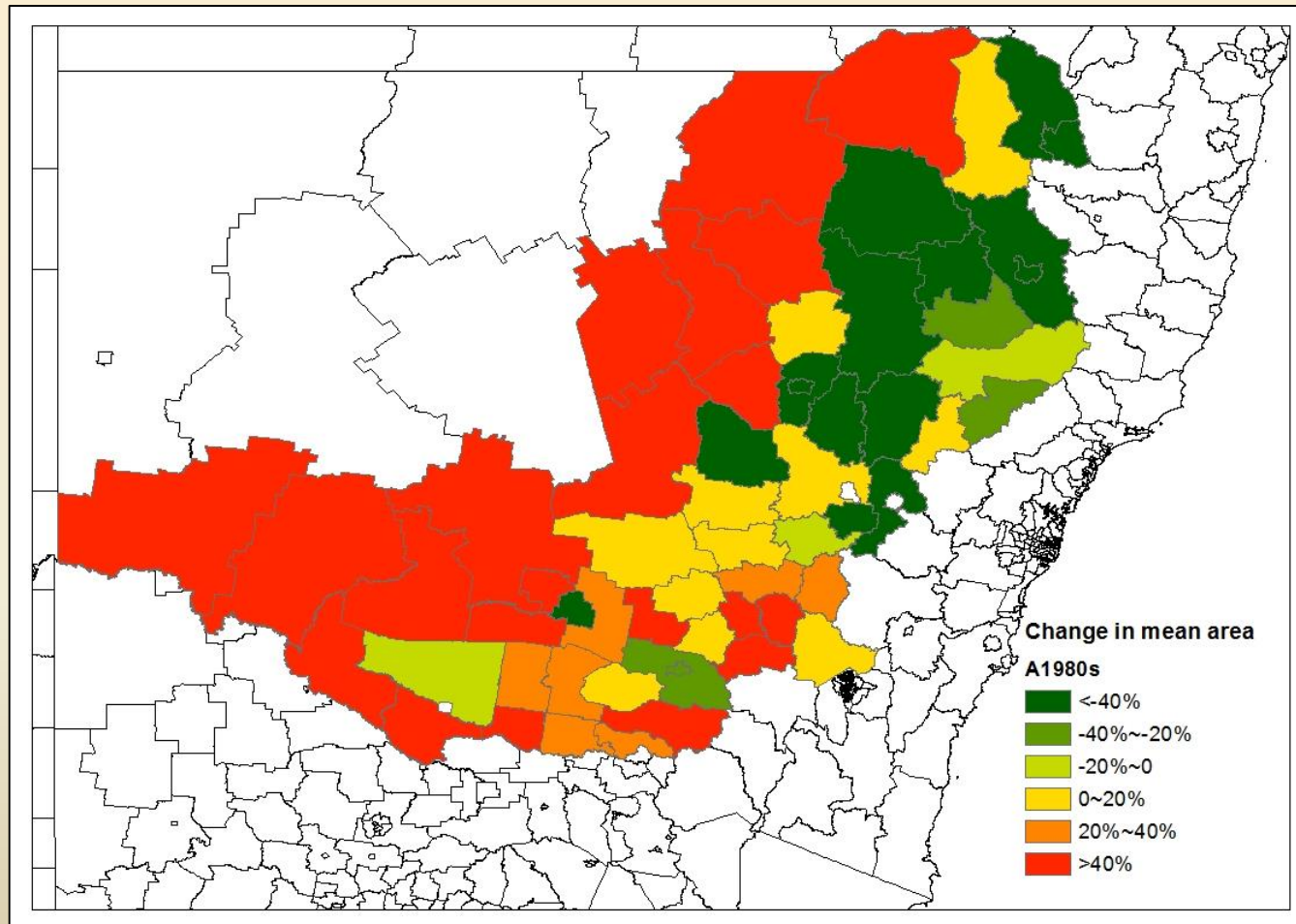


- 1940s: All states sowing area reduced by World War 2.
- 1970s: States show decreasing rate of sowing area expansion; Area decrease in VIC
- 1980s: A nation-wide swing to wheat due to the fall in wool prices causes renewed area increase.
- 1990s: Decreased production in NSW and VIC by sowing area decrease, coinciding with recession.
- 2000s: yield decrease in south east Australia caused by drought

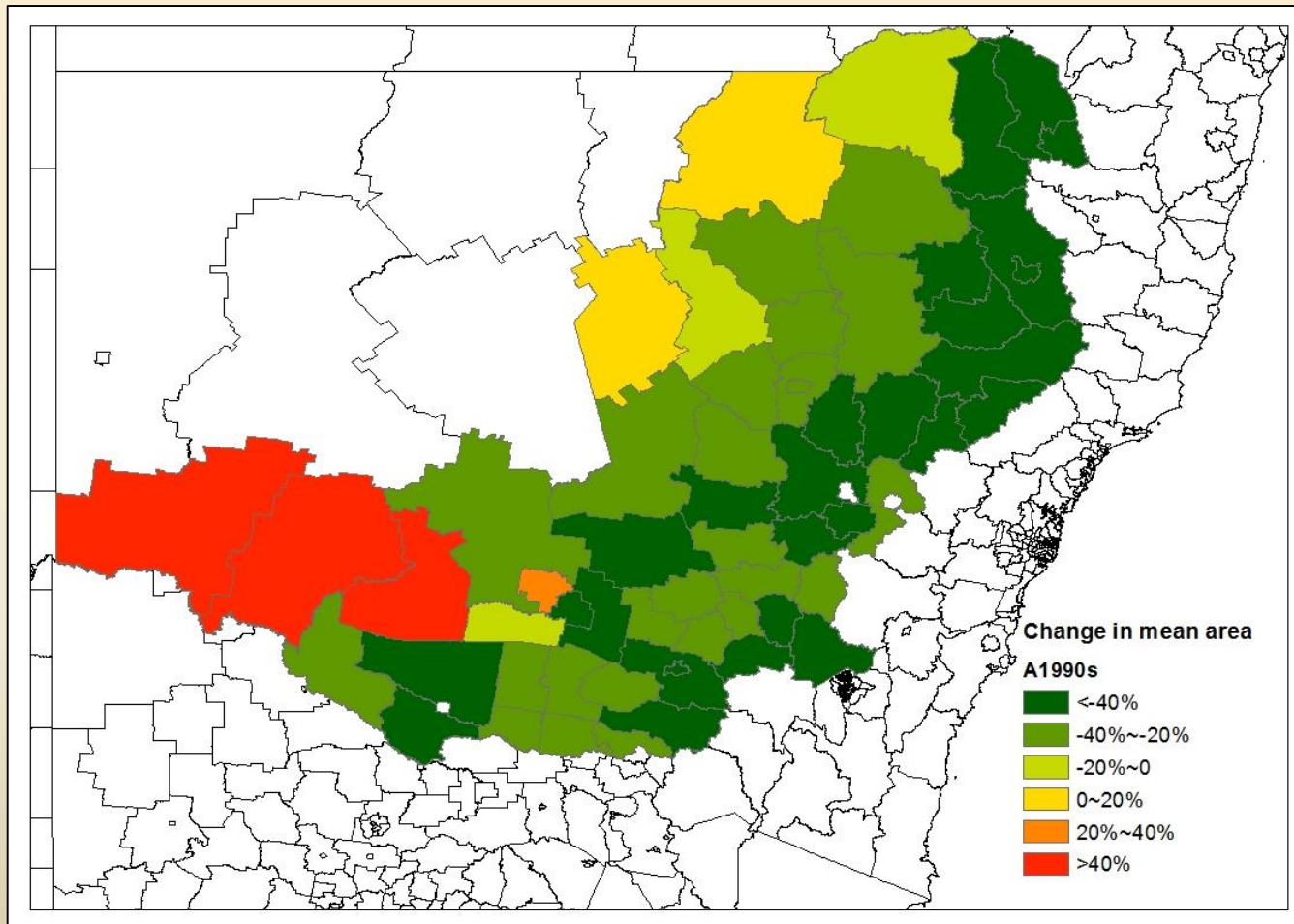
Spatial change in mean sowing area (NSW 1970s)



Spatial change in mean sowing area (NSW 1980s)



Spatial change in mean sowing area (NSW 1990s)



Summary

- The instability of Australia's wheat production has not been reduced significantly in the past century
- The yearly fluctuation of production is mainly caused by unstable yield.
- The increase trend of Australia wheat production is mainly due to sowing area increase in the past century .
- The effect of sowing area on wheat production increase is decreasing.

Questions and Comments

Thank you for your attention!